Instructions to Voters/Comments on API 520 Part I Ballot #4 – "Table 1 and Table 2 Improvements"

- Your comments should be limited to the **red-lines portions of the ballot only.** Red-lines shown in this 4th ballot include only the changes made during ballot comment resolutions for the 3rd ballot.
- This ballot covers Action Items 2016-16 and 2018-13.
- If you are voting negative, please indicate which of your comment or comments are the reason for your negative vote. API's Balloting system will categorize all of your comments as Negative.
- Don't worry about formatting issues, particularly with the equations since these are a mess. These will be fixed during final editing.

Thanks to Freeman Self and his work groups for their efforts.

Phil Henry

1st Ballot = 5728

2nd Ballot = 5915

3rd Ballot = 6222

BALLOT FOR ACTION ITEMS
AI-2016-16 – Table 1 & Table 2 Improvements
AI-2018-13 – Table 1 Improvements

Sizing, Selection, and Installation of Pressure-relieving Devices

Part I—Sizing and Selection

API STANDARD 520, PART I
ELEVENTH EDITION, XXX 2025

American Petroleum Institute

3 Terms, Definitions, Acronyms, and Abbreviations

3.1.20
double media certified pressure-relief valve
A liquid trim pressure-relief valve that is both vapor flow certified and liquid flow certified where the two certifications are separate but achieved without changing trim components when switching fluids during the flow testing. Adjustments and/or spring changes (including replacement) may be required to the pressure relief valve when switching fluids during flow testing. Only one certified capacity (or certified coefficient of discharge) will be marked on the ASME nameplate.

3.1.35
multiple media certified pressure-relief valve
A~~n~~ modified liquid or hybrid trim ASME certified pressure-relief valve that is liquid flow certified and vapor and/or steam flow certified where ~~one~~ a multiple media certification is achieved without making any modifications or adjustments to the pressure-relief valve when switching fluids during the flow testing. Multiple media certification is performed in accordance with ASME BPVC Code Case 2787. Multiple certified capacities ~~may~~ will be marked on the ASME nameplate.

4.2.1.4 Pressure-relief Valve Trim Selection

4.2.1.4.1 PRV trim selection is an important factor when designing relief system installations as it affects many of the performance characteristics of the PRV.

4.2.1.4.2 Common types of certified PRVs include ASME vapor certified PRVs, ASME liquid certified PRVs, PRVs that are multiple media certified and PRVs that are double media certified.

4.2.1.4.3 Although guidance can be provided by the valve manufacturer, it is up to the user to select the appropriate valve trim. This shall be clearly specified on the purchase datasheet (e.g. see the Pressure-relief Valve Specification Datasheet provided in Annex D). It is important that the user understands how different trims perform within the range of relief conditions that the PRVs could experience. Particular attention should be paid to vapor certified valves that have applicable liquid relief scenarios.

4.2.1.4.4 Table 1 summarizes some of the general ~~performance~~ characteristics of these valve designs. Table 2 summarizes the valve trim for different relief media and piping design criteria. Specific PRV models may have different ~~performance~~ characteristics for different relieving conditions. Consult the manufacturer for details of specific valve ~~performance~~ characteristics.

Table 1—Spring-loaded Pressure-relief Valve ~~Performance~~ Characteristics

Characteristic	**Vapor Certified PRV**	**Liquid Certified PRV**	Multiple Media Certified PRV (NOTE 2)	Double Media Certified PRV Marked for Vapor (NOTE 3)	Double Media Certified PRV Marked for Liquid (NOTE 3)
Liquid capacity	Capacity is not certified but can be estimated using guidance in 5.9 (may need up to 25 % overpressure to achieve full lift)	Capacity is certified	Capacity is certified	Capacity is not certified but can be estimated using guidance in 5.9 (may need up to 25 % overpressure to achieve full lift).	Capacity is certified.
Vapor capacity	Capacity is certified	Capacity is not certified. ~~See~~ Consult manufacturer for estimated capacity	Capacity is certified	Capacity is certified when set on compressible media.	Capacity is not certified. ~~See~~ Consult manufacturer for estimated capacity.
Approximate upper limit of blowdown available (~~see~~ Consult manufacturer for PRV-specific blowdown values; see NOTE 1)	Up to 10 % for vapor, and u~~U~~p to 10 % for liquid	Up to 20 % for vapors ~~or liquids~~ Typically, up to 10 % for liquids; caution, some vendors may have higher blowdowns	Typically between 10~~Up to~~ and 20 % for vapor. Some vendors may offer lower blowdowns. Typically, up to 10~~2~~ % for liquids; caution, some vendors ~~may offer~~have higher blowdowns	Up to 20% for vapors ~~or liquids~~ Typically, up to 10 % for liquids; caution, some vendors may have higher blowdowns	Up to 20 % for vapors ~~or liquids~~ Typically, up to 10 % for liquids; caution, some vendors may have higher blowdowns
Tendency to chatter in liquid service	Increased	Neutral	Neutral	Neutral	Neutral
Effect of medium on the opening pressure	PRV set on gas or vapor but relieving liquid may open 3 % to 5 % higher than the set pressure	PRV set on liquid but relieving vapor may open 3 % to 5 % lower than the set pressure	Minor effect (i.e. within code tolerances)	PRV set on gas or vapor but relieving liquid may open 3 % to 5 % higher than the set pressure ~~PRV set on liquid but relieving vapor may open 3 % to 5 % lower than the set pressure~~	PRV set on liquid but relieving vapor may open 3 % to 5 % lower than the set pressure

Effect of medium on pressure required for full lift	Any shift up or down in the opening pressure may result in a similar shift in the pressure at which full lift is achieved

NOTE 1 These are typical values obtained from valve manufacturers that may not be validated by test. User is cautioned to fully understand the impact on operations when blowdown exceeds the operating margin, see 4.2.5.

NOTE 2 See 4.2.1.4 ~~section xxxx~~ for guidance on specifying and capacity determination for multiple media certified PRVs.

NOTE 3 Only one certified capacity (or certified coefficient of discharge) will be marked on the nameplate. See 4.2.1.5 ~~section xyz~~ for guidance on specifying and capacity determination for double media certified PRVs.

Table 2—Selection and Design Guidance for Pressure-relief Valve Trims ~~Options~~

Relief Medium	Certified PRV Trim	PRV Inlet and Outlet Line Pressure Drop Calculation Basis		~~Comments~~
		Use PRV Rated Capacity (NOTE 5)	**Use Required Relief Load**	
Vapor	Vapor, Double Media (Marked for Vapor), or Multiple Media	✓	NOTE 1	
Vapor	Liquid or Double Media (Marked for Liquid)	NOTE 2	NOTES 1 & 2	~~Caution (NOTES 1 & 2)~~
Liquid	Vapor	NOTE 3	NOTES 1 & 3	~~Caution (NOTES 1 & 3)~~
Liquid	Double Media (Marked for Vapor)	NOTE 4	NOTES 1 & 4	~~Caution (NOTE 1)~~
Liquid	Liquid, Double Media (Marked for Liquid) or Multiple Media	✓	NOTE 1	
Two-phase	Liquid, Vapor, Double Media or Multiple Media	✓	NOTE 1	
Supercritical	Liquid, Vapor, Double Media, ~~Vapor,~~ or Multiple Media	✓	NOTE 1	

NOTE 1 Hydraulic calculations can use the required relief load ~~May be used~~ if the PRV exhibits modulating behavior, consult the manufacturer. A desirable practice may be to use the PRV rated capacity because using the required capacity necessitates knowledge of the PRV's modulating behavior (thus limiting the selection of PRVs)., ~~and may also constrain the facility's future operating capacity~~. Use of required capacity may require reassessment of the piping hydraulics if the required capacity increases in the future; see API-520 Part II Section 7.3.7.3.

NOTE 2 Application of a PRV certified only for liquid is not recommended if vapor is the controlling sizing case, since the valve is not certified for vapor. Where vapor loads are not controlling, the capacity of the PRV relieving vapor can be determined by the method in ~~API-520 Part 1~~ Section 5.6. Basis for pressure drop calculations may be for either required relief load or the PRV relieving capacity as appropriate. See Table 1 for blowdown performance characteristics.

NOTE 3 Application of a PRV certified only for vapor is not recommended if liquid is the controlling sizing case, since the valve is not certified for liquid. Where liquid loads are not controlling, the capacity of the PRV relieving liquid will need to be estimated using the noncertified liquid PRV sizing equation; see ~~API-520 Part 1~~ Section 5.9. Basis for pressure drop calculations may be for either required relief load or the PRV relieving capacity as appropriate. See Table 1 for blowdown performance characteristics.

NOTE 4 The manufacturer can be consulted to determine the appropriate capacity for pressure drop calculations and valve operating characteristics

NOTE 5 For PRVs flowing fluids for which the trim is not certified, the term analogous to "Rated Capacity" is "Relieving Capacity"

Bibliography

[20] ASME BPVC Code Case 2787, Section VIII, Division 1. Approval Date: November 1, 2013. "Multiple Markings of Certified Capacities for Pressure-Relief Valves."

Annex D
(informative)

Pressure-relief Valve Specification Sheets

Table D.1—Instructions for Spring-loaded Pressure-relief Valve Specification Sheet

Line No.	Instructions
1	Fill in item number.
2	Fill in user's pressure-relief valve (PRV) identification or tag number.
3	Specify service, line, or equipment to be protected. An equipment tag number and description should be included.
4	Specify number of valves required. A specification sheet for each PRV of a multiple valve installation should be completed.
5	Specify the applicable code(s) and whether Code Symbol nameplate stamping is required.
6	Valve should comply with API 526.
7	Check fire or specify other basis of selection. Consideration should be given to supplying all applicable overpressure scenarios. As a minimum, provide the governing sizing scenario for the vapor sizing case as well as the liquid sizing case if both are applicable.
8	Specify whether a rupture disk is being used under the PRV inlet.
9	Specify whether the PRV is conventional, balanced-bellows, and/or balanced piston.
10	Specify whether the trim type is liquid, vapor, Multiple Media, or Double Media.
11	Specify whether a restricted lift valve design is chosen (nonstandard API orifice area; see 4.2.4). The user should provide the manufacturer with a required capacity (Line 37) and the maximum desired rated capacity (specify in the general notes, Line 59).
12	Give description of PRV inlet design (full nozzle, semi-nozzle, or other type). Full nozzles are integral wetted components, which offer the advantage of removal for maintenance and replacement. The biggest advantage of a full nozzle is that the nozzle material can be upgraded without upgrading the metallurgy of the base. Semi-nozzles have the potential for leakage and require threaded connection that may require gaskets or welding. The use of a semi-nozzle also requires that the material of the base be compatible with the process fluid.
13	Specify open or closed bonnet. Open bonnets are limited to services that are nonhazardous, such as steam, air and water, since the process fluid will escape through the open bonnet upon actuation of the PRV. Open bonnets allow the spring to be cooled by ambient conditions in high-temperature applications.
14	Specify metal-to-metal or resilient seat. Metal-to-metal seats are typical. Soft seat designs are available that will minimize leakage. Operating temperature, pressure, and fluid corrosivity may limit the applicability of soft goods.
15	If other than API 527, specify seat test requirements. The ASME *Code* requires PRVs to be tested in accordance with API 527. Other codes may have alternate requirements.

Users of instructions should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein. Where applicable, authorities having jurisdiction should be consulted. Work sites and equipment operations may differ. Users are solely responsible for assessing their specific equipment and premises in determining the appropriateness of applying the instructions.

SPRING-LOADED PRESSURE-RELIEF VALVE SPECIFICATION SHEET			
		Sheet Number	Page of
		Requisition Number	
		Job Number	
		Date	
		Revision Number	
		By	
GENERAL			
1.	Item Number:	3.	Service, Line, or Equip. Number:
2.	Tag Number:	4.	Design Code or Standard:
BASIS OF SELECTION			
5.	Code: ASME VIII [ ] Stamp Required: Yes [ ] No [ ] Other [ ] Specify:	7. 8.	Fire [ ] Other [ ] Specify: Rupture Disk: Yes [ ] No [ ]
6.	Comply with API 526: Yes [ ] No [ ]		
VALVE DESIGN			
9.	Design Type: Conventional [ ] Bellows [ ] Balanced Piston [ ]	13. 14.	Bonnet Type: Open [ ] Closed [ ] Seat Type: Metal-to-Metal [ ] Resilient [ ]
10.	Trim Type: Liquid [ ] Vapor [ ] Multiple Media [ ] Double Media [ ]	15.	Seat Tightness: API 527 [ ] Other [ ] Specify:
11.	Restricted Lift: Yes [ ] N [ ]		
12.	Nozzle Type: Full [ ] Semi] Other [ ] Specify:		
CONNECTIONS			
16.	Inlet Size: Rating: Facing:	18.	Other [ ] Specify:
17.	Outlet Size: Rating: Facing:		
MATERIALS			
19.	Body:	25.	Spring: Washer:
20.	Bonnet:	26.	Bellows:
21.	Seat (Nozzle): Disk:	27.	Balanced Piston:
22.	Resilient Seal:	28.	Comply with NACE: Yes [ ] No [ ]
23.	Guide:	29.	Internal Gasket Materials:
24.	Adjusting Ring(s):	30.	Other [ ] Specify:
ACCESSORIES			
31.	Cap: Screwed [ ] Bolted [ ]	34.	Bug Screen: Yes [ ] No [ ]
32.	Lifting Lever: Plain [ ] Packed [ ] None [ ]	35.	Other [ ] Specify:
33.	Test Gag: Yes [ ] No [ ]		
SERVICE CONDITIONS			
36.	Fluid and State:	45.	Operating Temperature and Units:
37.	Required Capacity per Valve and Units:	46.	Relieving Temperature and Units:
38.	Mass Flux and Basis:	47.	Built-up Backpressure and Units:
39.	Molecular Weight or Specific Gravity:	48.	Superimposed Backpressure and Units:
40.	Viscosity at Flowing Temperature and Units:	49.	Cold Differential Test Pressure and Units:
41.	Operating Pressure and Units:	50.	Allowable Overpressure in Percent or Units:
42.	Set Pressure and Units:	51.	Compressibility Factor, Z:
43.	Blowdown: Standard [ ] Other [ ]	52.	Ratio of Specific Heats:
44.	Latent Heat of Vaporization and Units:		
SIZING AND SELECTION			
53.	Calculated Orifice Area (in square inches):	56.	Manufacturer:
54.	Selected Effective Orifice Area (in square inches):	57.	Model Number:
55.	Orifice Designation (letter):	58.	Vendor Calculations Required: Yes [ ] No [ ]
GENERAL NOTES			
59.			

NOTE The user should indicate items to be completed by the manufacturer with an asterisk (*).

Figure D.1—Spring-loaded Pressure-relief Valve Specification Sheet